Integrating Research into Information Technology Education

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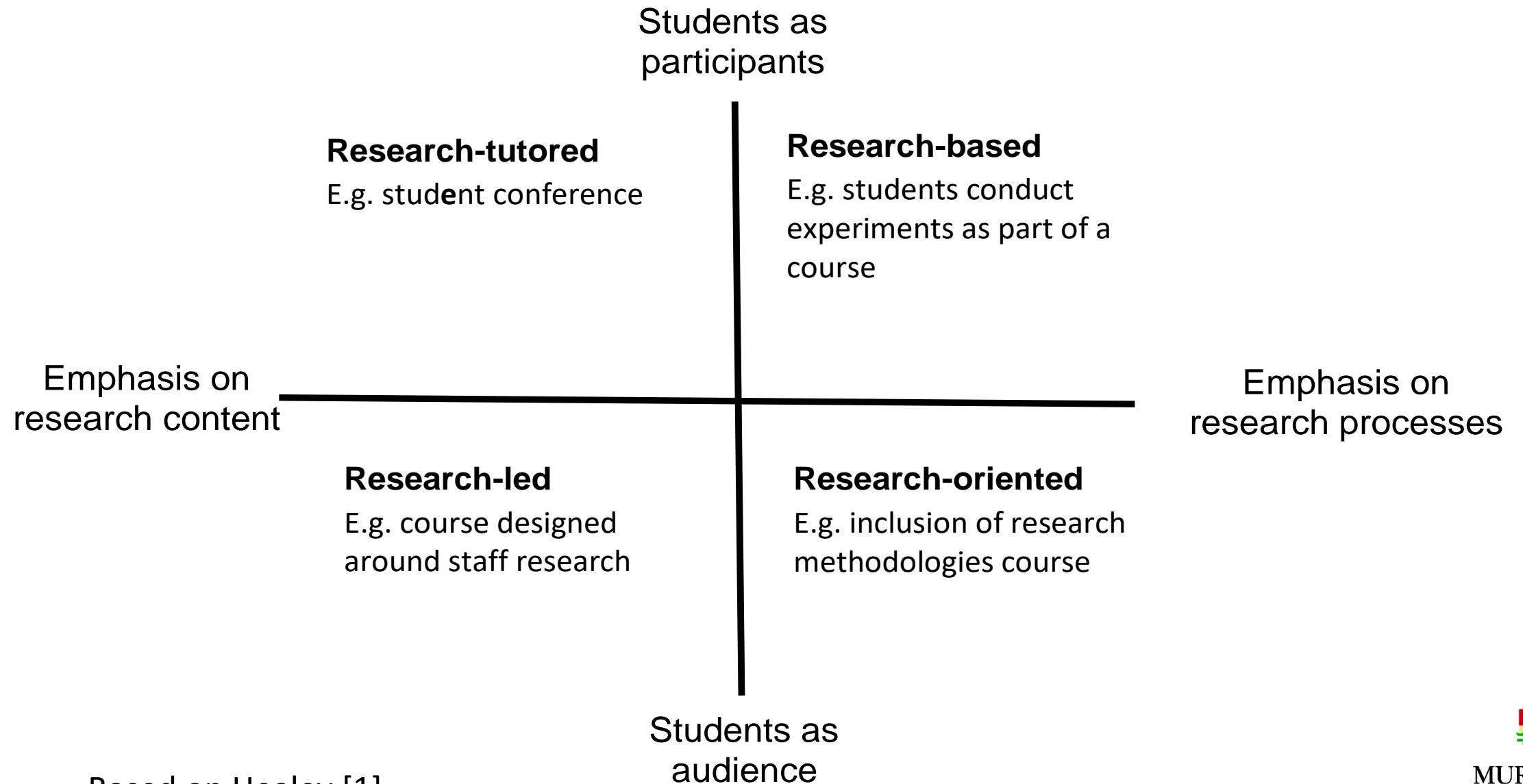
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Background

- Despite lack of conclusive evidence, there has been a general acceptance that there is value in having students engage with research

- Very few studies have explored this in the IT domain and little is known about the student perspective

- This project focusses on the potential benefits to undergraduate IT students from engagement with research

Types of research integration

Students as
participants

Research-tutored

E.g. student conference

Research-based

E.g. students conduct
experiments as part of a
course

Emphasis on
research content

Emphasis on
research processes

Research-led

E.g. course designed
around staff research

Research-oriented

E.g. inclusion of research
methodologies course

Students as
audience

Based on Healey [1]

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What **benefits** might students gain?

Many benefits have been proposed, and some investigated ….

- **Increased learning, increased interest, increased efficiency of learning** - Zhu and Pan [2] in Law courses

- **Desire to undertake postgraduate studies** - Turner et al. [3] in a range of courses

- **Improved employability** and **skills for long life learning** – Weinman et al. [4] and Khmelevsky [5] – anecdotal evidence from IT courses

However - Stappenbelt [6] found that the research-teaching nexus provided little benefit to students

Need to take in account the type of integration

What might **influence** whether students achieve the proposed benefits?

The following factors have been proposed to influence whether benefits are realised and Vereijken et al. [8] explored their impact on academic performance and found …

- Extent of direct **participation** in research - found no association

- **Awareness** of current discipline research - increased awareness was associated with increased academic performance

- **Motivation** – i.e. students' interest in research, and their enthusiasm for learning about it. Higher levels of motivation were associated with higher levels of academic performance

- **Beliefs** about the importance of research integration for students' learning were associated with higher levels of academic performance

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Aims of this project

- To investigate whether undergraduate IT students believe that they gain the benefits that have been proposed to flow from integration of research into IT education

- To identify factors that may influence achievement of these benefits

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Context of the study

- All UG degrees at Murdoch University introduced a 3 course 'research spine' as part of a curriculum redesign process

- All IT students take a 'transition' course for all BSc students plus two IT specific courses:
  - Introduction to ICT Research Methods (**Course 1**) - broad introduction to IT research
  - Applied ICT Research Skills (**Course 2**) - students undertake a group research project on an area related to their major

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Participants and data collection

- Participants were students who had attempted either one or both of Course 1 and Course 2

- 324 students were emailed and invited to complete an anonymous online SurveyMonkey questionnaire

- The questionnaire was open to responses for three weeks

- 116 responses were received

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Measuring benefits and factors influencing benefits

- The potential benefits measured were: perceived learning, perceived lifelong learning skills, interest in IT, interest in postgraduate study, and perceived employability
  - The items used to measure these were developed specifically for this study

- Factors potentially influencing benefits we measured were: participation in research, awareness of current research, beliefs, and motivation
  - The items used to measure these were based on the Student Perception of Research Integration Questionnaire (SPRIQ) developed by Visser-Wijnveen et al. [9]

- Likert scales from 1 'Strongly Disagree' to 5 'Strongly Agree' were used and an overall value was calculated for each benefit and factor for each participant

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Results - levels of perceived learning and lifelong learning

- **Perceived learning** was the benefit that students most believed they achieved (3.84/5)
  - 82.3% believed that that studying research skills had broadened their IT knowledge
  - 75.7% that it had increased their in-depth knowledge of IT

- Impact on **perceived lifelong learning skills** was also valued (3.75/5)
  - *[It] helped to understand what I can achieve when I set my mind to it*
  - *Research skills can help us to learn something new by ourselves*

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Results - levels of perceived employability and interest in IT

- Students had less confidence in the benefits relating to **perceived employability** (3.38/5) and **ongoing interest in IT** (3.35/5), but overall taking IT research skills courses was seen by many as of value
  - *.... I personally feel that these units offered useful and unique content that was not generally covered by other IT units. Gaining experience at undertaking research, writing literature reviews and completing research projects helped me become more passionate about studying Computer Science*

- However, a few felt that the time could have been better spent:
  - *Would have preferred to learn more about IT specifically and further my technical knowledge and skills, rather than learn general research and reporting skills, as research is not an area myself and a lot of others are interested in, preferring to look for jobs in programming or security.*

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Results - level of interest in postgraduate study

- The proposed benefit with the lowest level of achievement was **interest in postgraduate study** (2.97/5) and only 30.8% agreed that they were interested in postgraduate study in IT:
  - *I can see the value of research units if that is your focus, however i have absolutely zero interest in ICT research or pursuing it further outside of a university setting […] i would much rather do another core unit focusing on skills and knowledge related to my degree, something that is more relevant to the workplace.*

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Results – are 2 research courses needed?

	Course 1 Only (N=75)	Both Courses (N=33)	Increase
Perceived learning	3.78	3.98	0.209
Perceived lifelong learning skills	3.69	3.98	0.117
Perceived employability	**3.30**	**3.60**	**0.045***
Interest in IT	3.27	3.55	0.162
Interest in postgraduate study	2.90	3.12	0.341

Perceived achievement of ALL benefits was higher if had taken both courses – **but only the increase in perceived employability was significant**

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Results – what influences perceived achievement of the proposed benefits?

Multiple linear regressions were used to determine what factors influence whether IT students achieve the proposed benefits.

- The factors explained between 40% and 62% of the variability in perceived achievement of the benefits

- Different factors influenced different benefits

Results – what influences perceived achievement of the proposed benefits?

- **Motivation** – i.e. students' interest in research, and their enthusiasm for learning about it - was the most important factor, having a significant positive relationship with **ALL** of the proposed benefits

- **Participation** in research influenced perceived learning ($\beta=.30$, $p=.003$), interest in postgraduate study ($\beta=.29$, $p=.002$) and perceived employability ($\beta=.26$, $p=.006$)

- **Beliefs** about the importance of research integration for learning influenced perceived lifelong learning skills ($\beta=.38$, $p<.001$) and interest in IT ($\beta=.20$, $p=.005$)

- **Awareness of current research** did not influence achievement of any of the proposed benefits

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Aims revisited

- To investigate whether undergraduate IT students believe that they gain the benefits that have been proposed to flow from integration of research into IT education
  - ✓ Students do believe that they gain benefits from taking research units – in particular perceived learning and perceived lifelong learning skills

- To identify factors that may influence achievement of these benefits
  - ✓ Motivation, participation in research and beliefs all influence the extent to which students believe that they are gaining these benefits
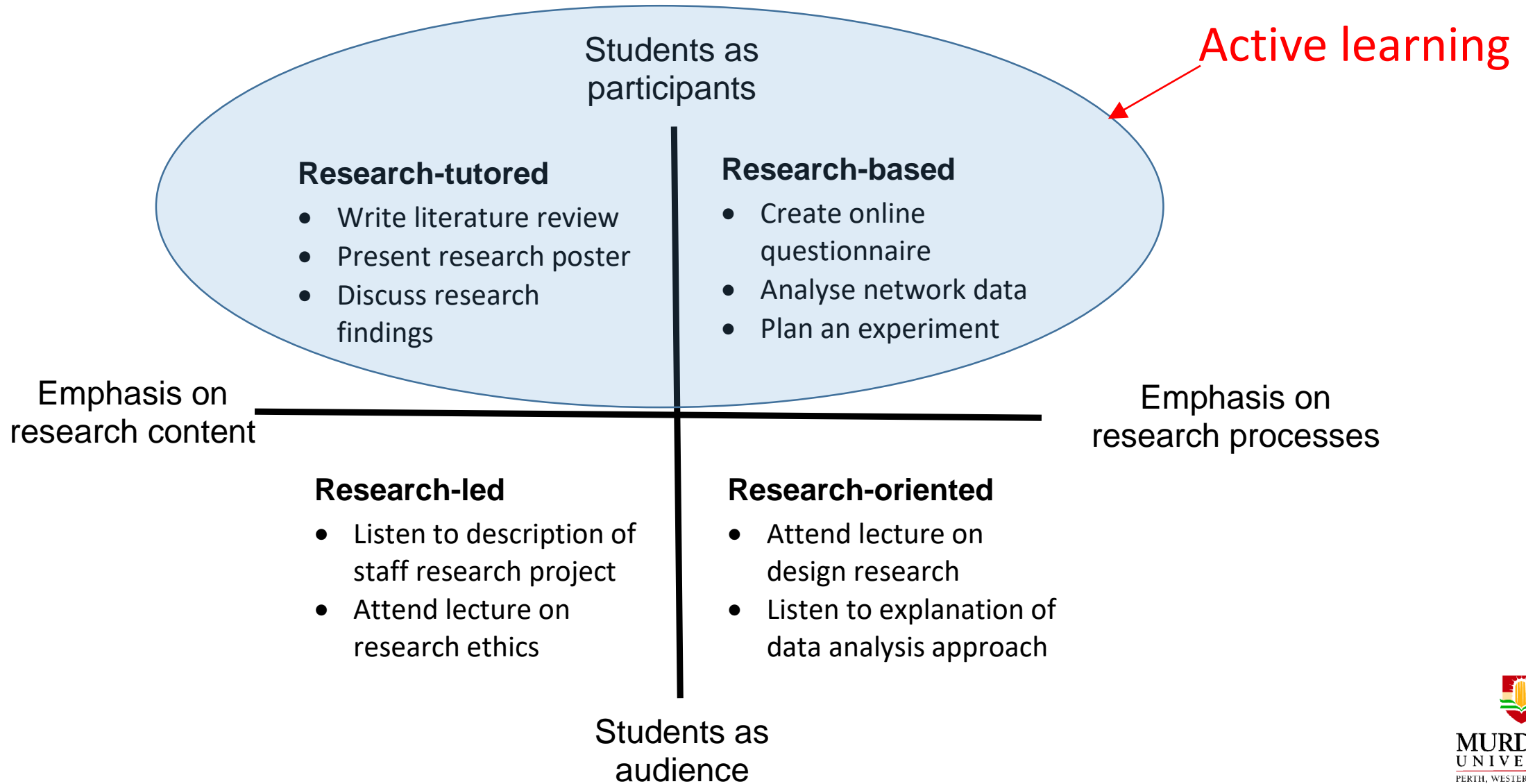
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Implications

IT research course design should target student motivation and participation by ensuring sufficient opportunities for active learning - emphasizing activities from Healey's research-tutored and research-based quadrants

Research-led approaches are probably not ideal

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Example activities – Course 1

Active learning

Students as participants

Research-tutored
- Write literature review
- Present research poster
- Discuss research findings

Research-based
- Create online questionnaire
- Analyse network data
- Plan an experiment

Emphasis on research content

Emphasis on research processes

Research-led
- Listen to description of staff research project
- Attend lecture on research ethics

Research-oriented
- Attend lecture on design research
- Listen to explanation of data analysis approach

Students as audience

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Questions?

References

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